REMARKS

Applicants thank the Examiner for the very thorough consideration given the present application. Claims 1-2 and 4-16 are now pending in this application. No new matter has been added by way of the present amendment. For instance, claim 7 has been amended to correct indefiniteness issues, as requested by the Examiner. Newly added claim 16 is supported by the specification at page 7, lines 29-35. Accordingly, no new matter has been added.

In view of the amendments and remarks herein, Applicants respectfully request that the Examiner withdraw all outstanding rejections and allow the currently pending claims.

Issues Under 35 U.S.C. § 112, second paragraph

Claim 7 stands rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter regarded as the invention.

The Examiner asserts that it is unclear whether the upper layer or the lower layer has a surface roughness. The Examiner further asserts that the expression "surface roughness as thermal spray coated" is indefinite as it is unclear what this limitation entails.

Claim 7 has been amended to more clearly recite the subject matter claimed. Accordingly, this rejection is moot.

Reconsideration and withdrawal of this rejection are respectfully requested.

Issues Under 35 U.S.C. § 103(a)

Claims 1-13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Mori (U.S. 4,579,712) (hereinafter Mori '712) in view of Kawagoe et al. (U.S. 5,875,702) (hereinafter Kawagoe '702). This rejection is respectfully traversed.

It is initially noted that claim 3 was cancelled by way of an amendment filed on July 20, 2006. Accordingly, this rejection is moot.

In regards to claims 1-2 and 4-13, the Examiner asserts that Mori '712 discloses a graphite-containing coating used as a material for piston rings. The Examiner further asserts that Mori '712 discloses that the material has a composition similar to that of the material of the instant invention. The Examiner acknowledges that Mori '712 does not disclose that the material is applied by spray coating, and relies on the teachings of Kawagoe '702 to cure the deficiencies of Mori '712.

Applicants respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness. To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on Applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Mori '712 is directed to a composite material for a **sliding member** (emphasis added) and not a piston ring. Furthermore, Mori '712 discloses a **sintered** (emphasis added) layer rather than a spray coated layer (see col. 1, lines 7-10). Applicants question whether Mori '712 sufficiently describes the invention in relation to use with a piston ring such that one of ordinary skill in the art would appreciate that the invention of Mori '712 includes a novel sintered piston ring that could be spray coated. Applicants respectfully submit that it does not.

Mori describes the following method for making a sliding member:

> *"To this end, according to another aspect of the invention, there is provided a method of manufacturing a sliding material, the method comprising the steps of providing a phosphor-bronze alloy powder which is passed by a 200 mesh screen and a graphite powder which is passed by a 350 mesh screen; providing a mixed powder having a composition consisting essentially of 0.03 to 1 wt.% phosphorus, 7.5 to 16 wt.% tin, 1 to 8 wt. % graphite, and the balance copper by mixing the phosphor-bronze alloy powder and the graphite powder; spreading the mixed powder on a back metal layer and then sintering the mixed powder to form a composite layer; and rolling the composite powder constituted by sintered mixed powder layer and the back metal layer to form a composite material for a sliding member having a predetermined thickness."*

If this method is used for producing a piston ring, the sintered product is bent in such a manner that the sintered layer is positioned on the outer circumferential side. Therefore, tensile residual stress is generated in the sintered layer. Meanwhile, when a bearing is produced by the method of Mori '712, compressive residual stress is generated in the heat sintered layer. This is advantageous from the standpoint of strength. However, it would be easy to anticipate the technical inconvenience of Mori '712 when applied to a piston ring. As such, it is unlikely that the invention of Mori '712 would be seen by one of ordinary skill in the art as being rationally applicable to piston rings as asserted by the Examiner.

Kawagoe '702 fails to cure the deficiencies of Mori '712. Kawagoe '702 is directed to swash plate compressors. Although this reference appears to disclose the use of thermal spraying, there is no suggestion regarding its use with piston rings. Furthermore, the layers thermally sprayed by Kawagoe '702 have a considerably different composition from the coating layer of the instant invention.

The Examiner asserts that Kawagoe '702 teaches that the coating may be a copper based bronze coating containing solid lubricants such as graphite. However, upon close inspection, it is noted that Kawagoe '702 discloses that only **3% or less** (emphasis added) of graphite is added, since higher graphite contents would disadvantageously lower the strength of the bronze. At column 10, lines 38-44, Kawagoe '702 explicitly discloses that:

> *"Furthermore, in the present invention, the bronze can contain not more than 3% of graphite by weight percentage... When the content of graphite exceeds 3%, the strength of bronze disadvantageously lowers.* ***The preferred content of the graphite is from 0.15 to 1.5%*** *(emphasis added)."*

Clearly, Kawagoe '702 does not teach or suggest the coating layer of the instant invention, which contains from 5 to 50 mass percent of graphite. In fact, Kawagoe '702 teaches away from the instant coating layer.

Evidently, neither Mori '712 nor Kawagoe '702 teach or suggest the thermal spray coated piston ring of the present invention. For this reason alone, this rejection is improper and should be withdrawn. Furthermore, one skilled in the art would not be motivated to modify the teachings of Mori '712 in the manner suggested by the Examiner or to combine it with Kawagoe '702, absent hindsight gleaned from Applicants' application. Indeed, the Examiner's proposed modification would clearly destroy the teachings of Mori '712. A *prima facie* case of obviousness may be rebutted by showing that the art, in any material respect, teaches away from

the claimed invention. *In re Geisler*, 116 F.3d1465, 43 USPQ 2d 1362 (Fed. Cir. 1997). Furthermore, if a proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

As previously discussed, the coating of Mori '712 is not a thermal spray coating, but rather a sintered one having a porous microstructure. The porous microstructure holds or stores oil within it, which is an essential feature (e.g. oil impregnation) of the bush and washer employed for bearings. Since the raw materials used in the prior art are coarse particles, the binding strength among the powder particles is small and the resulting alloy has poor bending properties and toughness. In order to solve this problem, Mori '712 proposed that fine particles such as phosphor-bronze alloy powder which passes through a 200-mesh screen, and graphite powder which passes through a 350-mesh screen be used to improve mechanical properties such as tensile strength, bonding strength and the hardness of the alloy layer. The use of fine particles increases the contact points of the particles in order to improve the mechanical properties. Porosity of the alloy layer is controlled by the sintering process such as control of the sintering temperature.

In view of the discussion above - and contrary to the position taken by the Examiner- if the thermal spraying of Kawagoe '702 was applied to the invention of Mori '712, the resulting powder particles of Mori '702 would be melted and sprayed onto a substrate and immediately freeze and form a coating of deformed particles in a lamellar structure. The Examiner should further note that in the thermal spraying process it is difficult to control the porosity of the alloy layer. Also, the microstructure strongly affects the mechanical properties of the sliding materials.

Thus, it is readily apparent that the intended microstructure and mechanical properties of Mori '712 could not be obtained by the thermal spraying process of Kawagoe '702.

Clearly, the present invention, as set forth in Applicants' claims, is not disclosed or made obvious by the cited prior art. Accordingly, reconsideration and withdrawal of this rejection are respectfully requested.

Conclusion

All of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding rejections and objections and that they be withdrawn. It is believed that a full and complete response has been made to the outstanding Office Action and, as such, the present application is in condition for allowance.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Marc S. Weiner, Reg. No. 32,181 at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.14; particularly, extension of time fees.

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Respectfully submitted,

By _____

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